93-01167/

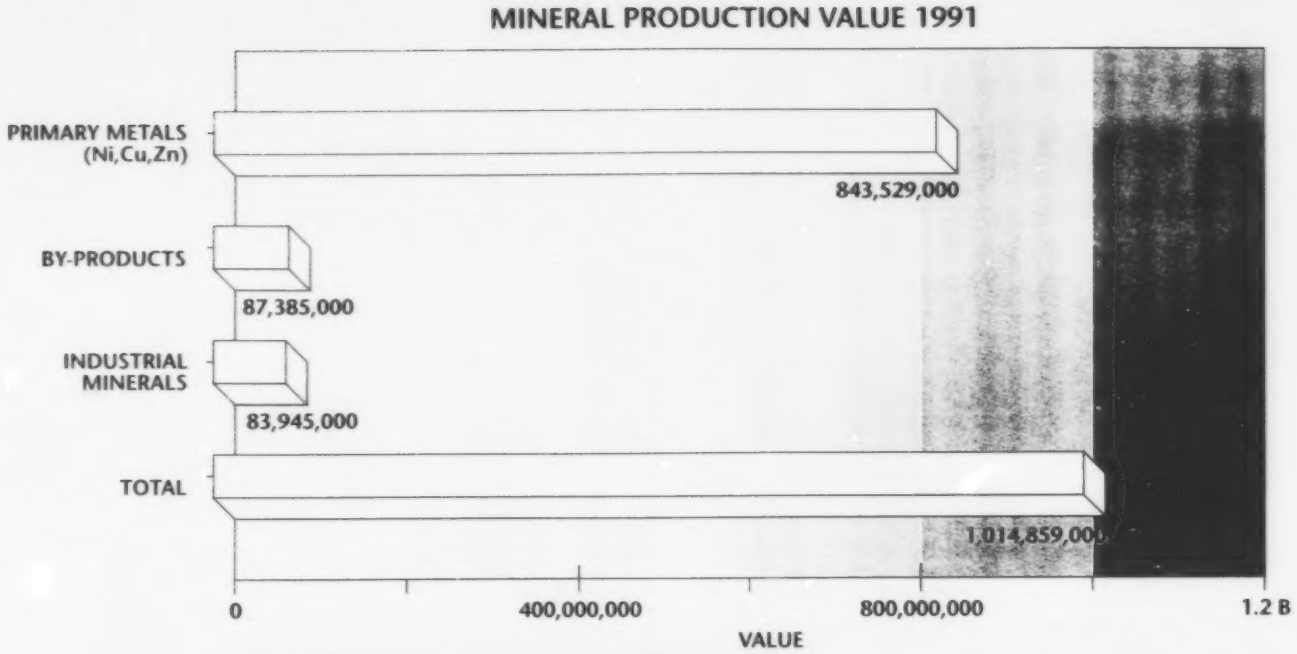
Mining in Manitoba '91

Manitoba
Energy and Mines

Mining is the second largest primary resource industry in Manitoba.

Government of Manitoba is committed to the principles of sustainable development.

Value of mineral production in Manitoba in 1991 was $1.01 billion.



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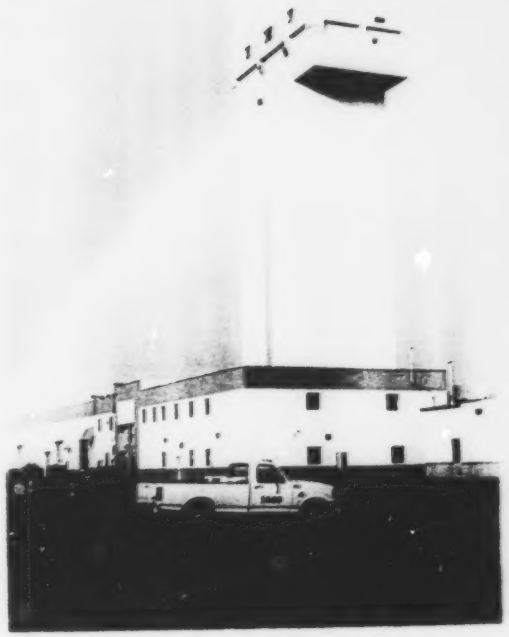
Industry Highlights

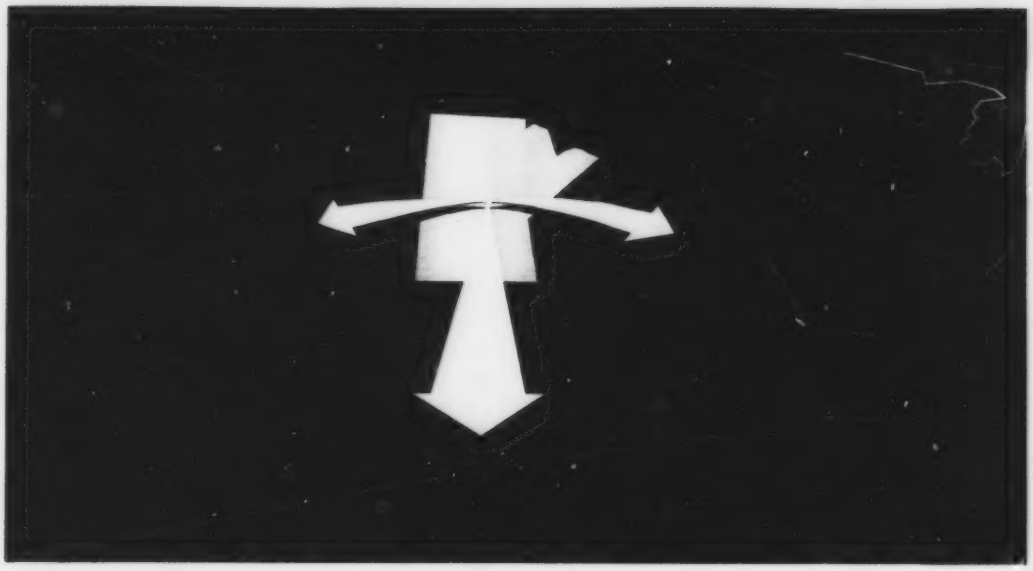


Major mining companies, and major and junior exploration companies, continued to play a leading role in mineral exploration and development in Manitoba in 1991, with an emphasis on base metals.

Recent achievements include:

- Discovery of new, deep, high grade sulphide lenses at the Trout Lake Mine (copper, zinc, gold, silver)
- Opening of the Callinan Mine (copper-zinc)
- Outlining of the Chisel North deposit (copper-zinc)
- Production commencing from the West Anomaly deposit at the Ruttan Mine (copper, zinc)
- Major capital works projects, are being conducted by Inco at the Thompson operation
- Full production reached at Inco Limited's Open Pit South (nickel)
- Continued encouraging results from gold exploration at the Monument Bay project
- Discovery of a base metal-bearing horizon at Leo Lake
- Apparent thickening, at depth, of the copper-zinc sulphide lens at MacBride Lake
- Active exploration on the southern extension of the Nickel Belt, under Paleozoic cover rocks
- Exploration for high calcium limestone in the Winnipegosis area

Location index map is inside back cover



Manitoba's central location

Manitoba Advantages

Manitoba has many natural advantages that make it attractive for exploration and mining.

These include:

- **a central location**
- **good access to North American and world markets**
- **a skilled workforce**
- **a low-cost, high-quality life style**
- **an established mining industry**
- **favourable geology**
- **good infrastructure**
- **a strong mining and exploration service sector**
- **Prospectors Assistance Program**

Manitoba Energy and Mines has created a Marketing Branch dedicated to promoting the development of the mineral resources of the Province. To this end Marketing will work with the exploration, mining and mineral processing industries, as well as the investment communities of Manitoba, Canada and the rest of the world.

MINING TAX HOLIDAY FOR NEW MINES

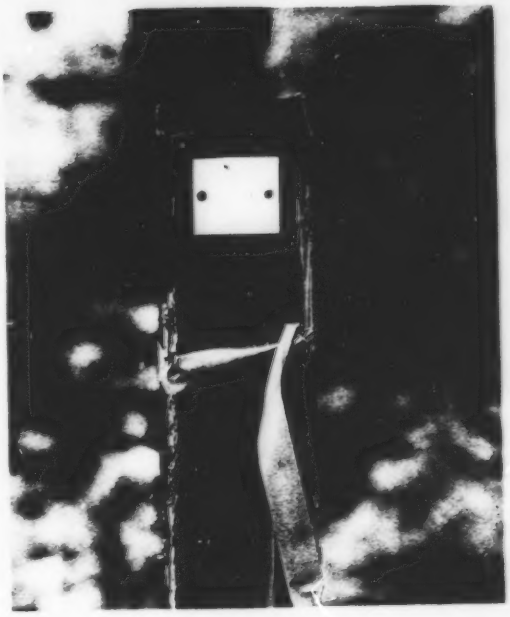
Qualifying mining operators will not be required to pay the mining tax until their profits for mining tax purposes equal their capital outlays.

MINING TAX EXPLORATION INCENTIVE

Mining Companies will be entitled to a deduction equal to 150% of exploration expenditures in a given year that exceed the average of these expenditures in the previous three years.

New Mines Act

The Manitoba Government has streamlined its mining legislation to facilitate investment, and to guide private sector exploration and development in the Province. Tnis new Mines and Minerals Act, expected to be proclaimed in 1992, is the first legislation in Canada to incorporate the principles of sustainable development.

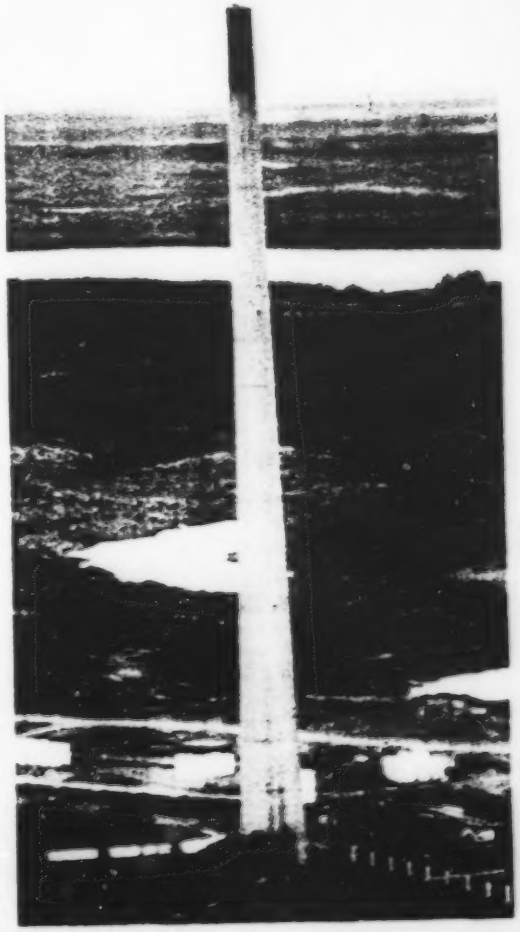


EXPLORATION INCENTIVE

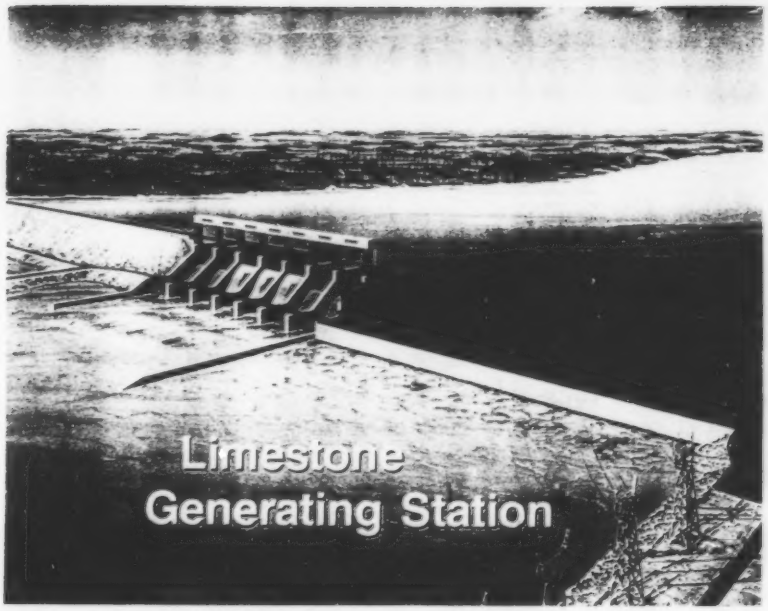
An exploration incentive program will be offered in Manitoba in 1992 whereby investors can obtain a 25% grant for investments in approved exploration projects. This "flow-through" incentive focuses on new exploration activities by junior exploration companies.

Environmental Improvement

Hudson Bay Mining and Smelting Co., Limited (HBMS) and the Governments of Canada and Manitoba have announced an $187 million environmental improvement program for the company's metallurgical plant in Flin Flon. This major project will reduce sulphur dioxide emissions by at least 25% and airborne particles by over 50%, to comply with environmental legislation due to take effect in 1994. Consumption of heavy oil and coal will be substantially reduced, and carbon dioxide emissions will be lowered by over 300 000 tonnes per year. Construction during plant improvements will employ up to 230 people.



(top) The first step to mineral development success
(above) Aerial view of HBMS operation at Flin Flon



Artist's conception of Limestone Generating Station

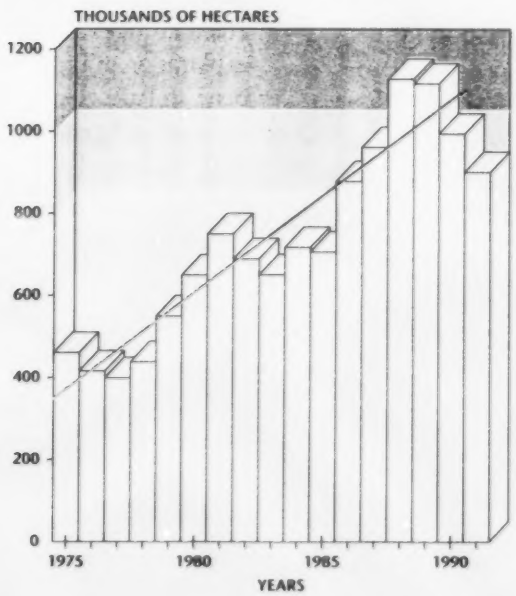
Electrical Energy

The commissioning of the 1 330 megawatt Limestone Hydroelectric Generating Station is evidence of the Province's commitment to abundant low cost power supplies. Current electricity rates, ranging between 2.88 cents and 3.49 cents per kilowatt hour, depending on load factor, are some of the lowest in North America.

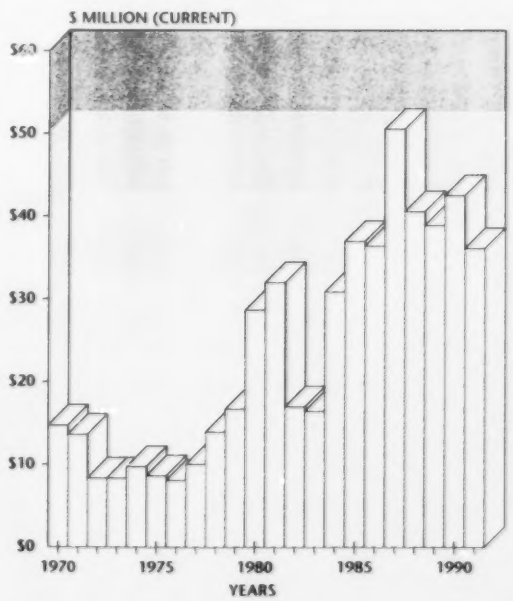
Exploration and Development

Although exploration expenditures have generally declined during the current recession, new government initiatives are designed to reverse this trend. A positive indicator of activity levels is the one million hectares of claims currently in good standing.

AREA OF CLAIMS IN GOOD STANDING



ESTIMATED MINING EXPLORATION EXPENDITURES



Exploration in Manitoba

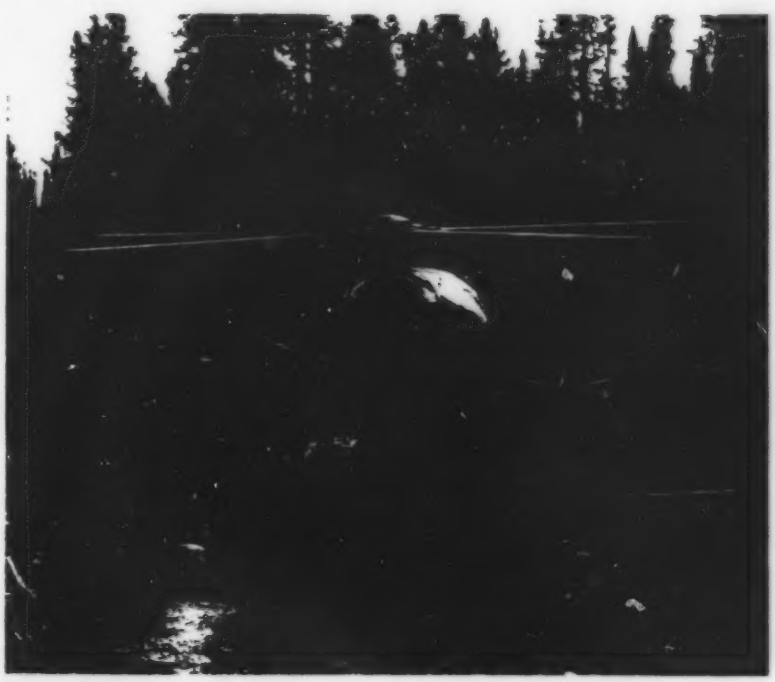
HUDSON BAY MINING AND SMELTING CO., LIMITED. (HBMS)

At the *Trout Lake Mine* near Flin Flon, exploration drilling by **HBMS** and partners **Granges Inc.** and **Manitoba Mineral Resources Ltd.** (MMR) has outlined two new high grade zones. The best result reported from a recently discovered lens is an impressive intersection of 45.5 m of 2.47% copper, 9.8% zinc, 3.2 grams/tonne gold and 36.7 grams/tonne silver.

At the *Callinan Mine*, just north of Flin Flon, underground exploration drilling continues to add new ore reserves at depth.

At the *Ruttan Mine*, east of Leaf Rapids, development of the *West Anomaly deposit* from the 660 metre mine level has been completed up to the 630 metre level and down to the 690 and 740 metre levels. An exploration drilling program is underway to investigate this deposit between the 320 metre level and 550 metre level.

Remote areas are only a flight away from northern centres



HUDSON BAY EXPLORATION AND DEVELOPMENT COMPANY LIMITED (HudBay)

HudBay continued to drill in the *Chisel Lake Mine* area throughout most of 1991. The company also is actively exploring for base metals at Anderson Lake, Embury Lake, Namew Lake, Snow Lake, Manistikwan Lake, Bear Lake, and in the former *North Star Mine* and the *Wim deposit* areas in the Flin Flon-Snow Lake belt, and at Rat River, west of Nelson House. In addition, **HudBay** is exploring for gold mineralization in the Third Cranberry Lake area, southeast of Flin Flon.

HudBay and partner **Granges Inc.** continue to test the potential for additional base metal resources at the former producing *Westarm Mine*.

INCO LIMITED

In the Thompson Nickel Belt, south and southwest of Thompson, **Inco Limited** conducted geophysical and drilling programs at Ospwagan Lake, Burntwood Lake, Paint Lake, Nichols Lake and in *Birchtree Mine* area.

FALCONBRIDGE LIMITED

Falconbridge Limited carried out base metal exploration in Precambrian rocks buried beneath Paleozoic cover rocks. This activity included airborne geophysical surveys at Cedar Lake and in the Wabowden area, and ground geophysical surveys at Minago River and South Moose Lake, in addition to diamond drilling at Cedar Lake, William Lake, Hargrave River, and near Ponton.

COMINCO LTD.

Cominco Ltd. conducted geophysical surveys and drilling on their Special Permit at Lake Winnipegosis. This activity is expected to continue in 1992 because many geophysical targets have not yet been tested.

NORANDA EXPLORATION COMPANY LIMITED

Noranda Exploration Company Limited was involved in several prospecting, geophysical and drilling programs in northeastern Manitoba. With partner Bellex Mining Corp., they obtained further encouraging drilling results from the Monument Bay project, southeast of Gods Lake, northeastern Manitoba. Previous drilling revealed three gold-bearing zones estimated to contain geologically inferred reserves of 2.4 million tonnes grading 2.74 grams/tonne gold, 472 000 tonnes at 15.77 grams/tonne gold and 590 000 tonnes at 9.94 grams/tonne gold. In addition, Noranda is conducting gold exploration at Wekusko Lake, southeast of Snow Lake.

GRANGES INC.

Granges Inc. has discovered a complexly folded base metal-bearing horizon at Leo Lake, 20 km east of Flin Flon. The average weighted grade of 21 core length intercepts is 4.0% copper and 2.7% zinc, with minor gold and silver over an estimated horizontal width of 3.6 metres. Mineralization is open in all directions and drilling is expected to continue in 1992. Granges is also exploring for base metals at Eldon Lake, near Lynn Lake, and for gold at Second Cranberry Lake, southeast of Flin Flon.

MANITOBA MINERAL RESOURCES LTD.

MMR conducted geophysical, geological mapping and drilling programs at the Beaucage Lake gold property south of Lynn Lake, optioned from Mid-North Resources Limited in 1990. They also carried out base metal exploration at Arbour Lake, east of Lynn Lake. In addition, MMR conducted geophysical surveys and diamond drilling programs in the search for base metals in Precambrian rocks buried beneath Paleozoic cover rocks in the Minago River and the McClarty and Talbot lakes areas.

Who knows how much mineral wealth there is to be discovered in Manitoba

Stake your claim in Manitoba

OTHER EXPLORATION ACTIVITY

Minnova Inc. completed a 5 000 metre drill program at the Big Island property, east of Flin Flon. A prime target is a faulted extension of the previously discovered **Westfield Minerals Limited** high grade polymetallic deposit.

In the Dyce Lake-North Moose Lake area, northeast of The Pas, partners **Teck Corporation, Consolidated Samarkand Resources Inc.** and **TSA Explorations Ltd.** completed line cutting, geophysical and diamond drilling on their permit. Additional drilling is expected in 1992.

Cameco Corporation conducted line cutting, geophysical surveys and geological mapping at Counsell Lake in the Lynn Lake area. In addition, reconnaissance mapping and prospecting programs for gold mineralization were carried out at Elbow Lake and Reed Lake in the Flin Flon-Snow Lake area. **Cameco** conducted surface exploration and a substantial drill program in the Paleozoic terrane, in the Winnipegosis area, to test for high calcium limestone.

Copperquest Inc. is involved in base metal exploration at Bear Lake in the Flin Flon area.

Goldbelt Mines Inc, conducted base metal exploration in an area south of the *Ruttan Mine*, east of Leaf Rapids. At MacBride Lake, east of Lynn Lake, **Eastmin Resources Inc.** and **Bellex Mining Corp.** continued a drill program to explore the *Knobby Lake* zinc-copper deposit at depth. Drill results released in December, 1991 include 6.1 metres of 10.08% zinc and 0.30% copper at a vertical depth of 275 metres. **Bellex Mining Corp.** claims this drilling indicates a thickening of the sulphide lens at depth.

Black Hawk Mining Inc. carried out additional drilling on the Minago River nickel deposit in Precambrian rocks buried beneath Paleozoic cover rocks.

Gold mineralization near Naosap Lake, east of Flin Flon, is being investigated by **A.L. Parres Ltd.**

International Falcon Resources Inc., Cominco Ltd., Rodren Drilling Ltd., Cameco Corporation., and a few individual prospectors carried out overburden drilling, prospecting, geophysical surveys and diamond drilling during investigations of gold properties in southeast Manitoba.

TVX Gold Inc. (formerly INCO Gold) has sold its 34.1% stake in **High River Gold Mines Ltd.** to **Restech International of Australia.** High River controls the *Nor-Acme deposit*, a former producer at Snow Lake, that contains proven, probable and possible reserves of 3.8 million tonnes grading 6.5 grams/tonne gold and remains open at depth and along strike. **Restech** plans to expand on **TVX Gold's** $6 million of exploration.

Tantalum Mining Corporation of Canada Limited (TANCO) continued exploration drilling for pegmatites in the Bird River area.

A large portion of Manitoba is underlain by Paleozoic rocks. Although there is no active exploration for Paleozoic-hosted lead-zinc deposits in the Province, this terrane cannot be overlooked as a potential source for this deposit type.

Metallic Mineral Mining in Manitoba

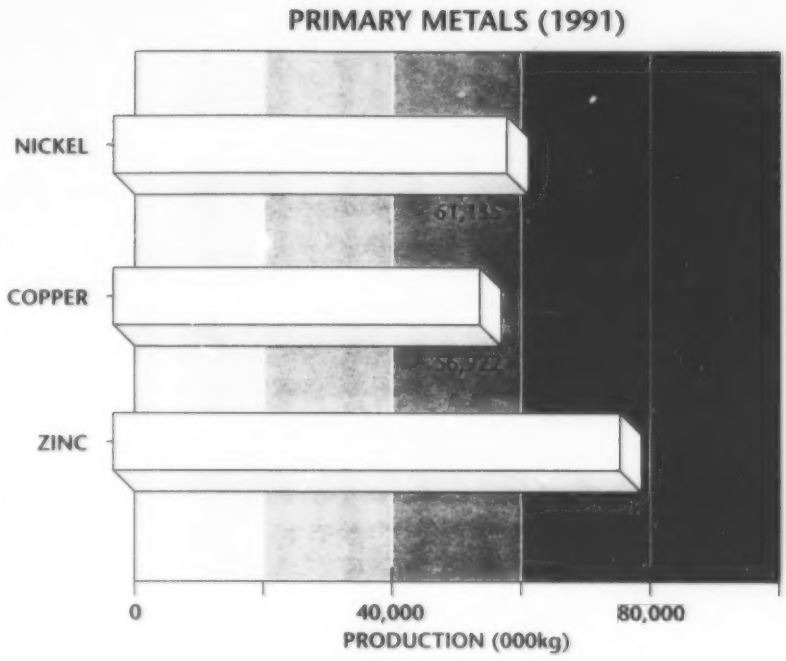
NICKEL

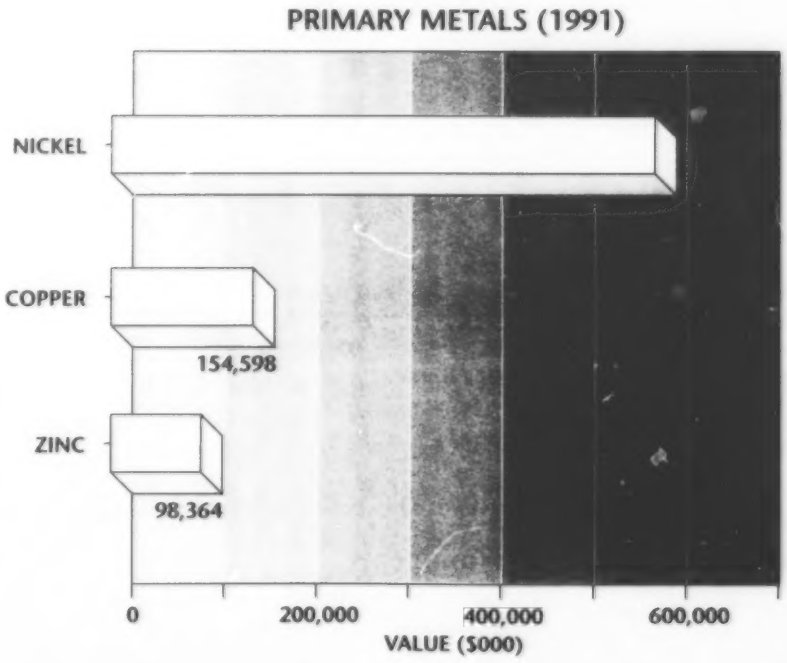
Inco Limited has mined nickel sulphide ore from 9 mines in the Thompson area, since 1960. Its modern, fully integrated mine, mill, smelter and refinery complex produces nickel cathode and high copper-nickel matte, which also carries platinum group metals. Pentlandite concentrate and cobalt oxide are shipped to Alberta and the United Kingdom respectively for refining.

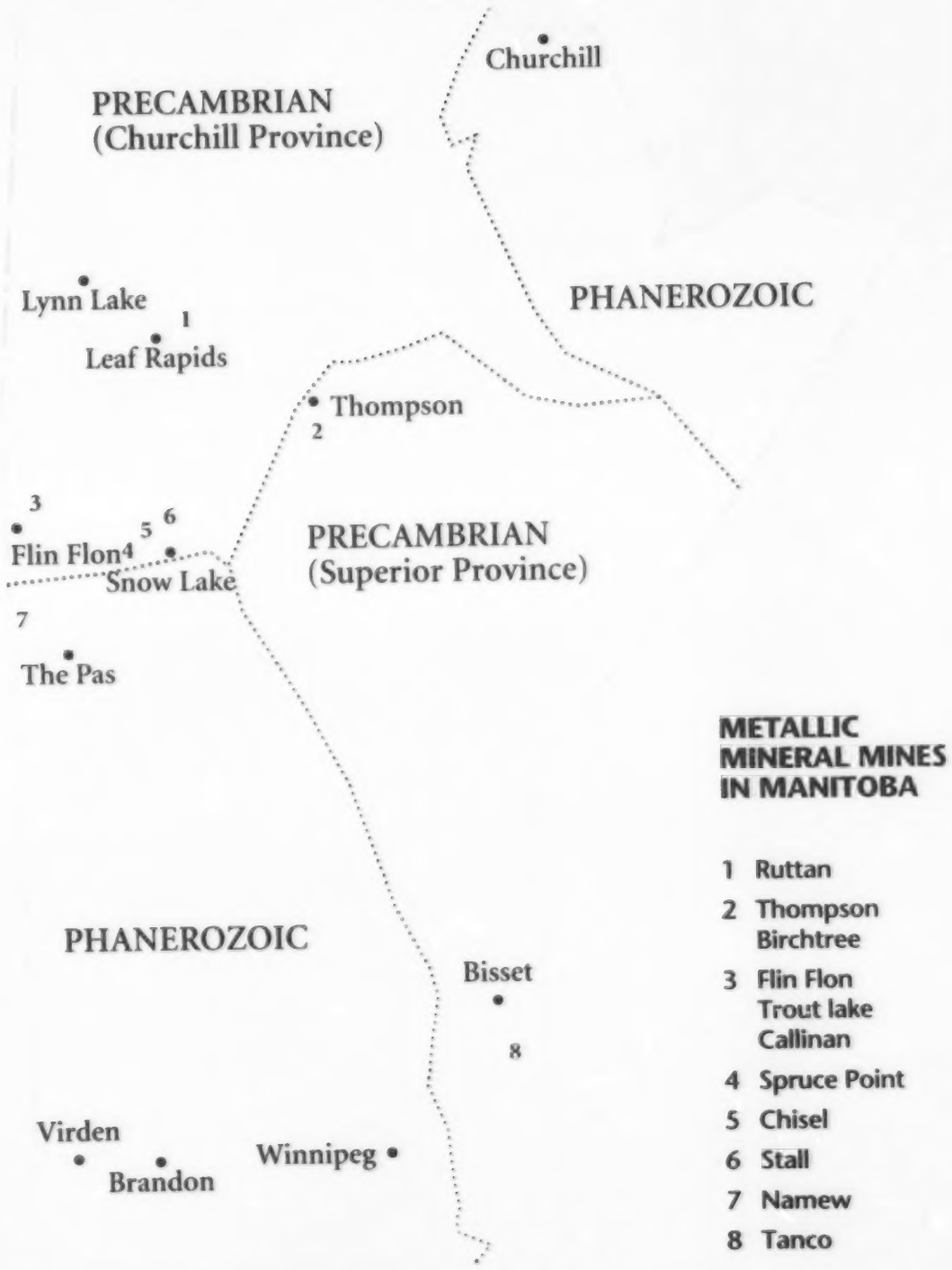
Capital development projects at **Inco's** Manitoba Division are continually being reviewed in response to nickel market conditions. Development programs currently under way will maintain scheduled divisional production requirements. Development in 1991 at the new *1-D Orebody* (an extension of the Thompson deposit) consisted of level advance on the 488, 732 and 1 097 metre levels, as well as ramp development from the 786 metre level. Development on the 1 097 metre level exploration drift was started. Limited production is expected from the *1-D* beginning in 1994. Development work at the Thompson mine *1-C Orebody* continued and production of 1 450 tonnes per day is expected by 1993 increasing to 1 650 tonnes by 1995.

Full production at **Inco's** *Open Pit South* was reached in 1991. Average production throughout the year was 21 500 tonnes of total material per day. The waste to ore ratio is approximately 3:1.

Average production from **Inco's** *Birchtree Mine* increased from 1 450 tonnes per day in 1990 to 1 800 tonnes per day in 1991. New development consisted of installation of the 640 metre level tram system, as well as ramp, sublevel and drawpoint development. The proposed $78 million shaft deepening program has been deferred.







METALLIC MINERAL MINES IN MANITOBA

1 Ruttan
2 Thompson
Birchtree
3 Flin Flon
Trout lake
Callinan
4 Spruce Point
5 Chisel
6 Stall
7 Namew
8 Tanco

Underground at Tanco

COPPER-ZINC

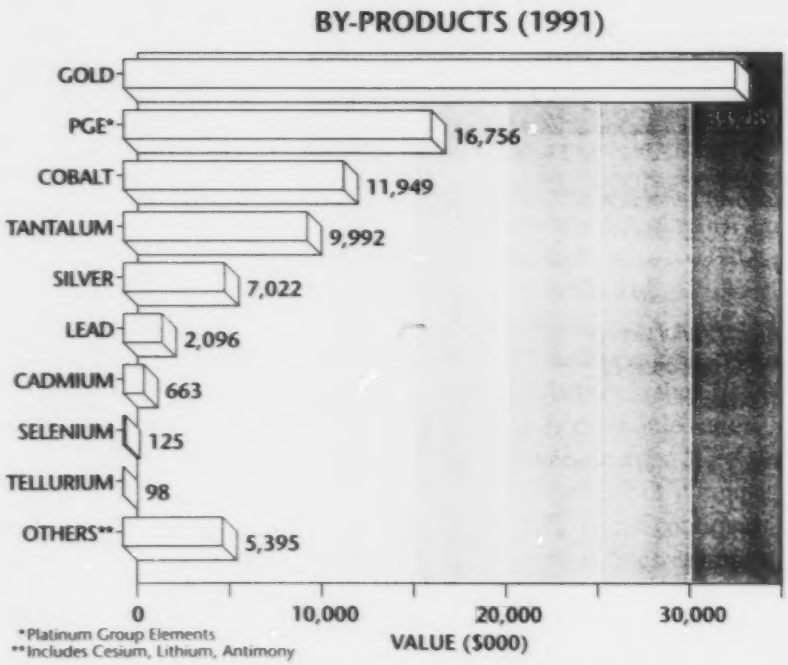
HBMS has extracted base metal ore from 21 mines to produce copper anode, zinc slab and cadmium sponge at its Flin Flon plant during 65 years of operation in Manitoba.

In the *Trout Lake Mine* **HBMS** and partners have agreed to develop a cross cut in the hanging wall to explore the deposit down to the 1 100 metre level.

The *Callinan Mine*, put into production in April, 1990, is currently producing at a rate of approximately 45 000 tonnes per month.

HudBay stated in late 1990 that reserves for the new Chisel North deposit were in excess of 2.7 million tonnes grading 9.0% zinc and 0.17% copper.

At the *Ruttan Mine*, near Leaf Rapids, **HBMS** has commenced production from the *West Anomaly deposit.* Diluted, proven and probable reserves of this newly outlined deposit are stated at 5.78 million tonnes grading 1.34% copper and 2.13% zinc.

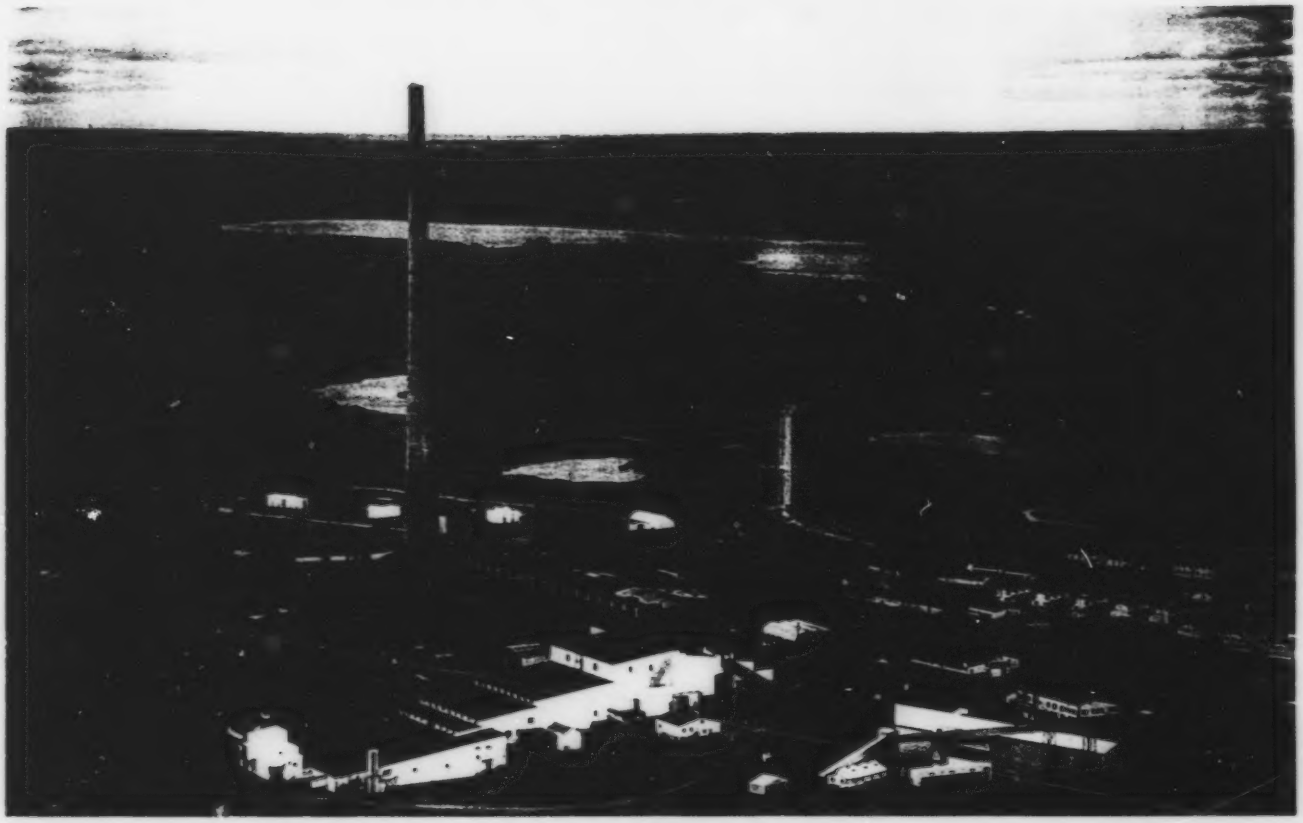


TANTALUM

Tanco produces tantalite concentrate at its world unique, multimineral pegmatite deposit at Bernic Lake near Lac du Bonnet in southeast Manitoba

BY-PRODUCTS

In addition to the dominant metals nickel, copper and zinc, there is a wide variety of metal by-products produced from mining operations in Manitoba. These include, in decreasing order of dollar value; gold, platinum group elements, cobalt, tantalum, silver, lead, cadmium, selenium and tellurium.



(above) Aerial view of HBMS operation at Flin Flon

(right) Aerial view of INCO operation at Thompson

Nonmetallic and Industrial Minerals Mining

Aerial view of Tanco's operation at Bernic Lake

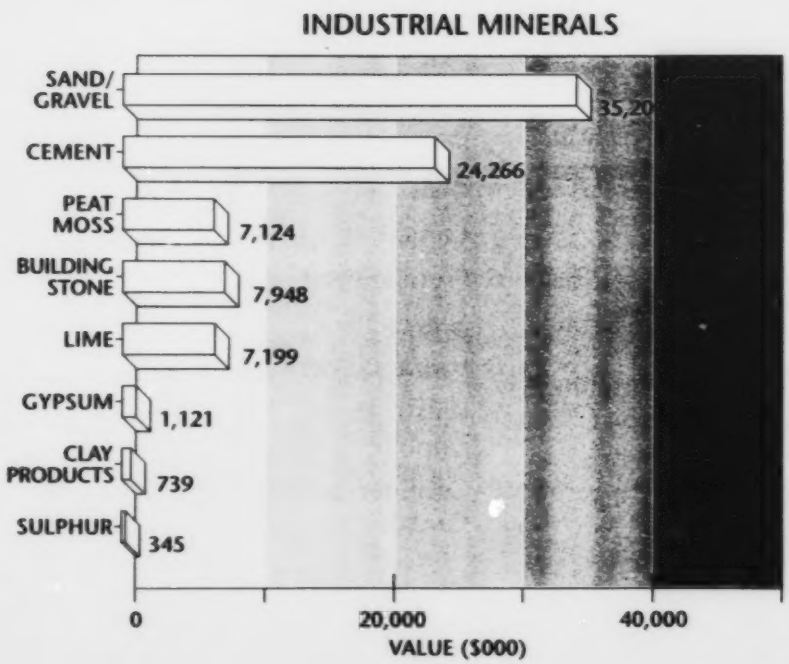
Tanco produces a high grade spodumene concentrate, as well as amblygonite and potassium feldspar as by-products, for the ceramics industry. In addition, pollucite concentrate is produced for the production of cesium products.

Aggregate deposits occur throughout Manitoba. They are quarried primarily for use in road construction.

Lime is produced from high calcium limestone, at Faulkner, by **Continental Lime Ltd.**

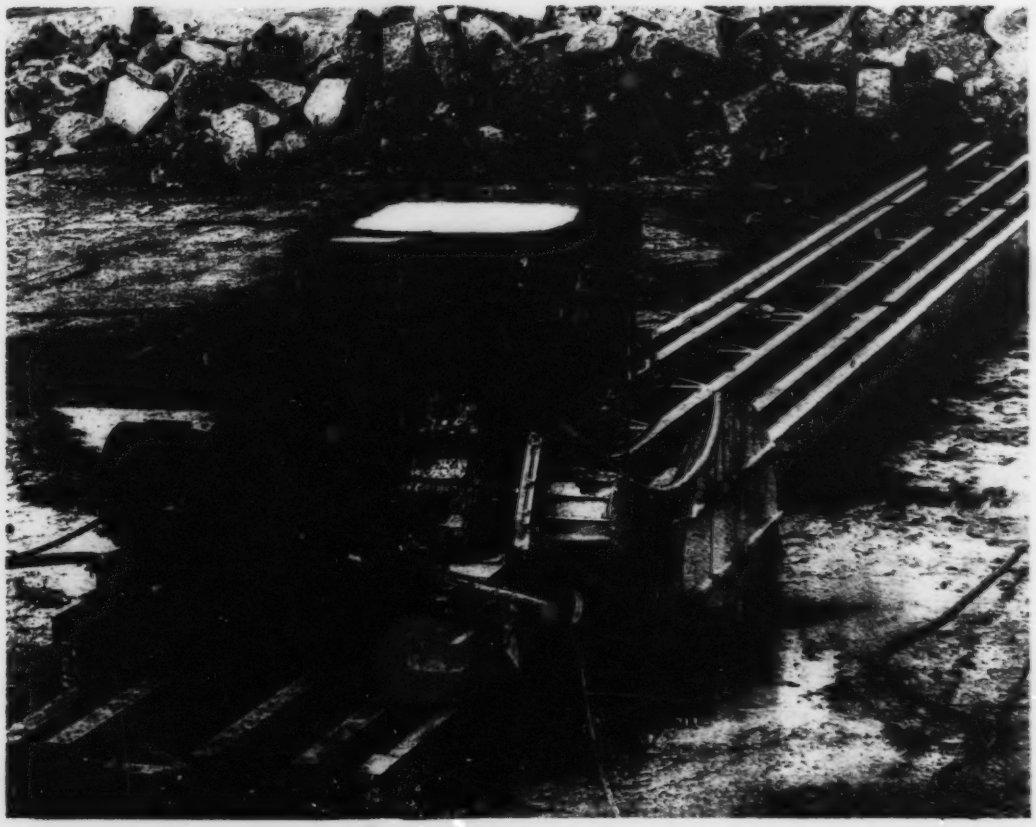
High calcium limestone, for production of cement, is quarried at Mafeking by **Inland Cement Co. Ltd.**, and at Steep Rock by **Canada Cement Lafarge Ltd.**

Gypsum, used in the production of wallboard, is mined at **Harcus by Westroc Ltd.** and by **Domtar Construction Ltd.**

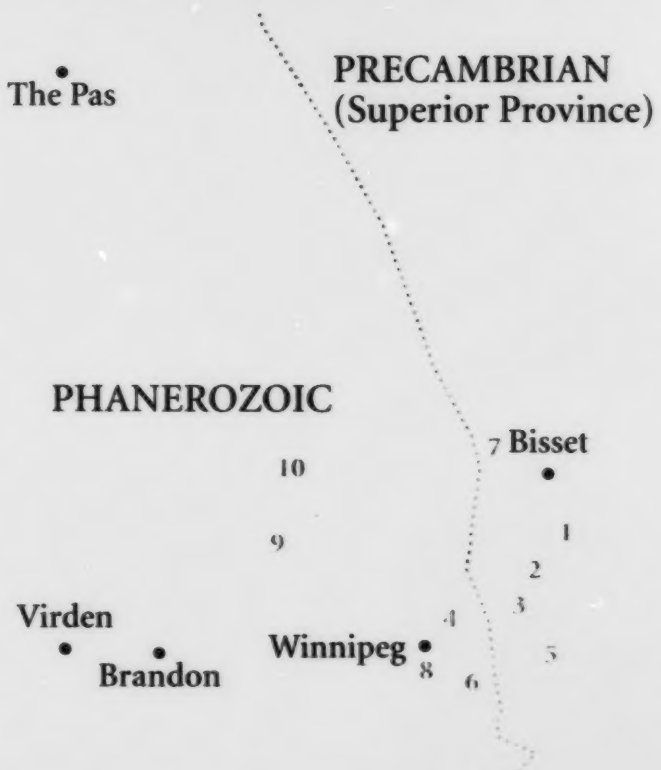


Granite and dolomite building stone is extracted from several quarries in the Province. Manitoba's magnificent mottled and fossil laden *Tyndall stone* is quarried at Garson, 25 kilometres northeast of Winnipeg, by **Gillis Quarries Ltd.** This stone continues to be specified for major buildings, examples of which are the Museum of Civilization, the Parliament Buildings in Ottawa and the Manitoba Legislative Building.

Decorative Manitoba granite is quarried at Darwin, Lac du Bonnet and Medika by **Shield Quarries of Canada Ltd., Coldspring Granite Ltd.** and **Canital Granite** respectively. Canital also operates a world class granite tile plant in Winnipeg. Manitoba granite has been specified in commercial and public building projects in Canada, the U.S.A. and Japan.



Stone cutting equipment at Gillis Quarries



NONMETALLIC AND INDUSTRIAL MINERAL MINES/QUARRIES IN MANITOBA

1 Tanco
2 Cold Springs
3 Fisons Western
4 Gillis
5 Canital
6 Premier West
7 Selkirk Silica
8 Inland Cement
9 Westrock
Domtar
10 Continental Lime
Canada Cement LaFarge

Potential Developments

POTASH

A joint-venture between **Potamine Potash Mining of Canada Inc.**, and the Province of Manitoba, was established to develop known potash reserves in the Russell area.

MAGNESIUM DOLOMITE

Manitoba Energy and Mines, Business Development staff are evaluating the potential use of Manitoba's dolomite resources from the interlake region.

HIGH CALCIUM LIMESTONE

A study is being conducted, under the current Federal/Provincial Partnership Agreement on Mineral Development, to determine potential uses and markets for Manitoba's high calcium limestone resources.

CERAMIC MINERALS

Manitoba has significant resources of a variety of industrial minerals that may be combined for the production of traditional ceramics. Inputs such as kaolin, spodumene, amblygonite, potassium feldspar, and silica are now undergoing chemical and physical tests to determine their ceramics potential.

SILICA

A study is being conducted, under the current Federal/Provincial Partnership Agreement on Mineral Development, to evaluate the economic and market potential for high purity silica sand .

GOLD

Several past producing gold mines, and undeveloped deposits, contain reserves of recoverable gold. These are located in areas where necessary infrastructure is in place. Present gold price appears to be the main impediment to renewed development.

CHROME

The largest undeveloped chromite deposit in North America is located in the Bird River area, southeast Manitoba. Manitoba Energy and Mines has supported metallurgical research that has pioneered a process whereby a relatively low grade chromite can be co-smelted with nickel ore to produce, on a bench scale, a ferrochrome nickel masteralloy (36% chrome, 18% nickel, phosphorous levels <0.03%) suitable for the stainless steel industry. The stainless steel industry has expressed interest in this project. Favorable results from the metallurgical work being conducted at Laurentian University could lead to the world's first chrome nickel masteralloy feed for the stainless steel industry.

VANADIUM/TITANIUM

Samples of ilmenite (Fe, V, Ti) from occurrences in the Pipestone Lake area, east of Cross Lake are being metallurgically examined for their chemical and physical properties. Manitoba Energy and Mines is supporting a metallurgical engineering thesis on V_2O_5 material from these occurrences.

BUILDING STONE

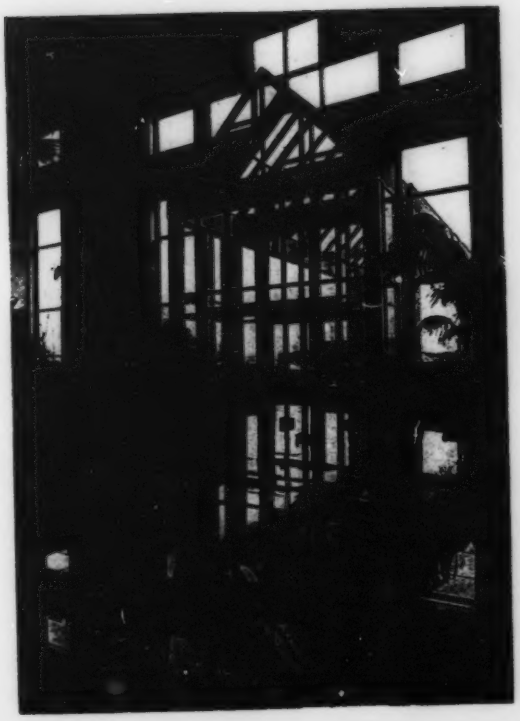
Manitoba Energy and Mines is assisting Manitoba producers in the search for new markets for the various building stone commodities.

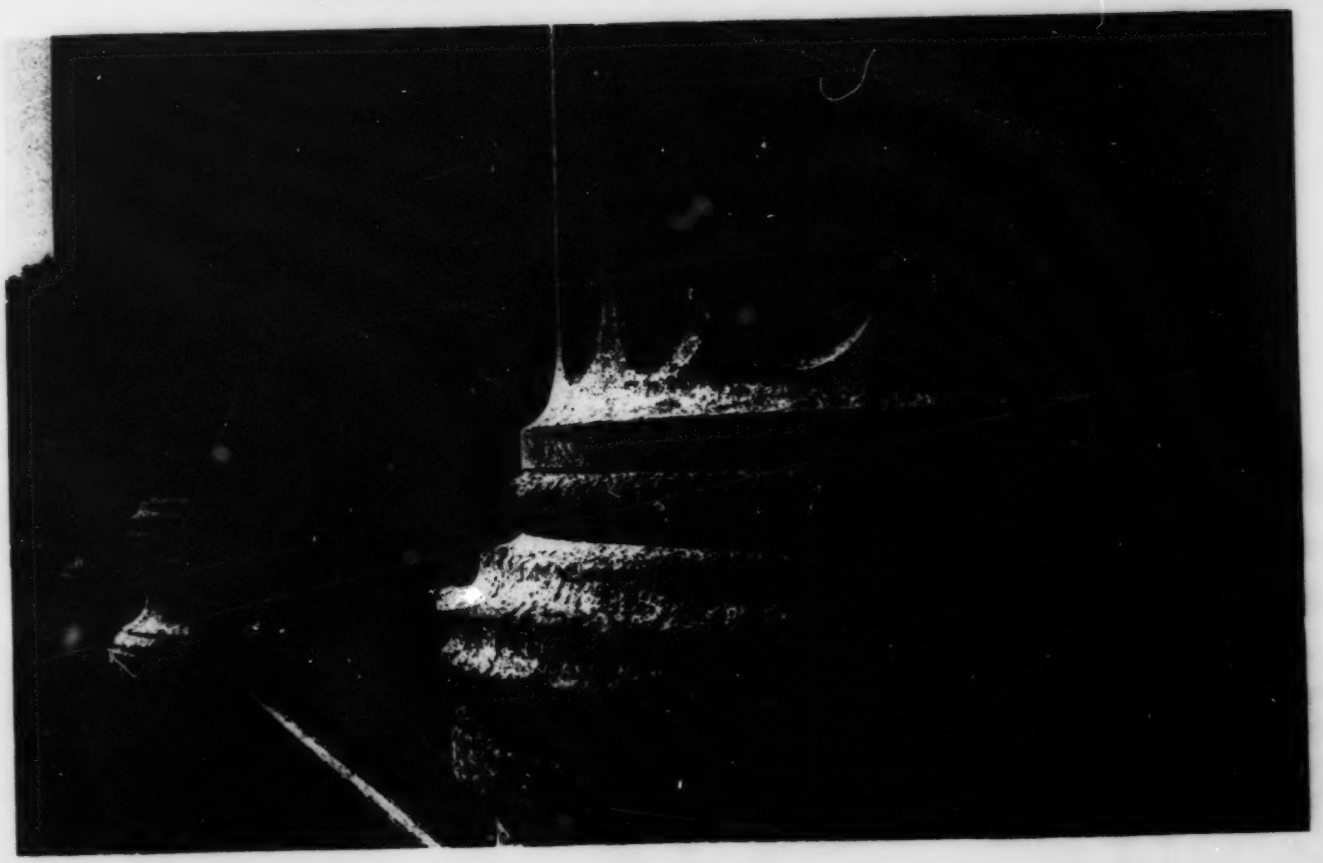
Building With Manitoba Stone

Decorative Manitoba granite in the Parkway Suites Hotel, Thorold, Ontario

(far left)
Winnipeg Art Gallery

(below)
Majestic Tyndall Stone columns frame the entrance to Manitoba's Legislative Building





Location Map